
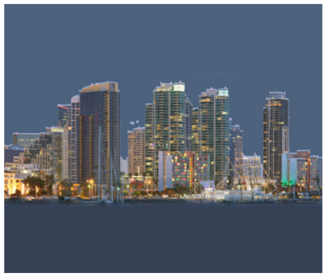

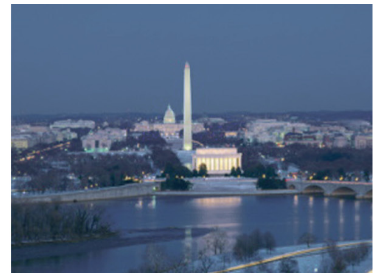

THE BROAD DIMENSION

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tbd consultants

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In this Edition:

Wearable Computers & Construction

The idea of wearable computers can be traced back a long way, such as to the abacus-on-a-ring dating from the time of the Qing Dynasty in China. But the modern-day concept is usually dated from 1981 when Steve Mann created a wearable computer, with the computer itself in a backpack and a visual display unit was mounted over one eye, making the user look rather like a Borg from the Star Trek universe. Technology has continued to shrink the size of computers to the point that almost all of us carry around computers that have far more processing power than an early PC had, in the form of our cell phones.

In many ways, cell phones could be looked on as wearable computers, but for this article we will narrow down the definition a bit further. Here we will describe wearable computers as being portable computing devices with which the user has constant interaction, and they have a heads-up display and allow the user to keep both hands free. A heads-up display is similar to the way a fighter pilot might have information projected onto the cockpit window in front of him, giving additional information to the pilot, while not blocking the view ahead. People get into enough problems walking down a street with their concentration on their cell phone screens, and a paved street has far less potential dangers than the average construction site. Someone touring a construction site is also likely to need both hands available for climbing ladders or negotiating scaffolding, so even carrying a laptop can be a problem at times.

The obvious way to input information to a computer with out having to use your hands is by voice command, but noise on a construction site presents some problems with this. Other input methods have been experimented with, such as the use of gestures. For instance, a program has been developed for Google Glass that allows the user to take a photograph just by blinking their eye. The idea is that user and computer are linked to the point that the computer becomes a sort of sixth sense.

Google Glass can probably be described as the first wearable computer to be made easily and readily available to the general public, although it is certainly not the first of its kind. For instance, the military have had similar, if less stylish, technology for many years (the US Army has used wearable computers since 1989). Google Glass comes with a 640x360 pixel head-mounted display, voice command input along with other sensor inputs, a 5 megapixel camera, WiFi and Bluetooth connectivity, and has a dual-core processor, 1GB of RAM and 16 GB of Flash storage. And that comes in something that doesn't look too much different than a normal pair of glasses.

Wearable, or body-borne computers can sometimes assist handicapped people to overcome their disabilities. One example has been the use of a camera attached to such a system that has allowed a blind person to regain some vision.

All of the uses that wearable computing may have in construction will not become apparent until the technology is in general use for a period of time and people's imaginations have had opportunity to explore its potential, but here we will look at some of the ideas that have been explored so far.

One of the first things that Steve Mann (the pioneer in wearable computing that we mentioned earlier) first added was a camera, and Google Glass also has a camera. Using such technology, a person on site could take a remote design team or the building owner for a virtual tour of the construction site. Also, when problems arise on the site, the technology would allow the design team members to be shown immediately what the problem was, even if the team members are in another country, and hopefully lead to speedier resolution and reduced claims for delay.

The fact that the user has the computer mounted somewhere on them, or their clothing, means that body sensors can be easily connected and the sensor data can be transmitted wirelessly back to a monitoring station. Such technology has been used in the medical field for some time, and it has been suggested that construction workers could be monitored, leading to faster responses in the event of an accident (which is still too common an occurrence on construction sites). But privacy issues might be one blockage to the adoption of that idea.

For work such as preparing punch lists or progress reports, wearable computers save a substantial amount of time wasted in reworking site notes into the final report. With the new technology, the final report can be prepared while walking around the site.

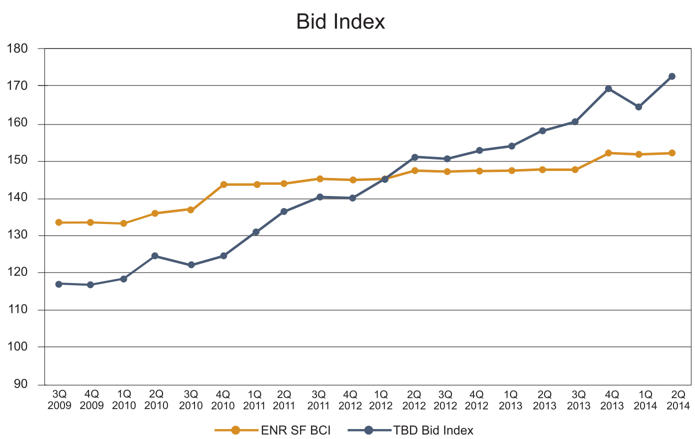
The size of the heads-up display that a wearable computer uses can be a lot larger than that of an average laptop, so viewing and navigating through large documents such as construction drawings can be a lot easier. So someone doing a site inspection could call up the drawings and check that work is being carried out correctly. And with design being carried out in BIM more regularly these days, the person touring the site would be able to see the 3-D model at the same time as seeing the current state of the building. So they could go on a physical and a virtual tour at the same time.

The use of robotic and 3-D printing techniques are expected to grow substantially in the construction industry, and smart infrastructure systems are already in regular use. All of these technologies are computer-driven, so wearable computers are an ideal interface for controlling and monitoring them.

Wearable computers is one of the sectors in the PC industry that is expected to show substantial growth over the next few years. Of course, the advent of cell phones has meant that we have become unable to escape from emails wherever we are, so the arrival of wearable computers may just mean that we can't escape from other aspects of work either. But they do have an 'Off' switch.

Are We There Yet?

The construction industry took its beating from the Great Recession in 2009. Five years later and confidence in the recovery still wavers at times. Our TBD Bid Index is back up to the highs of 2007, but that discounts the way labor and material prices have continued to rise despite the recession, so in effect we are definitely not back to where we were.



Some regions in the nation are doing better than others. For instance, the San Francisco Bay Area is one region where construction has picked up noticeably, but even there contractors and subcontractors are still showing a reluctance to increase staff levels as much as they might, because they still have doubts about the strength of the recovery. The result is that bidders can be hard to find for some projects, as contractors have enough work to keep their existing staff going. Any project that appears onerous to bidders is likely to be by-passed.

The scarcity of contractors in a region experiencing a boom can be a benefit to those in nearby regions. As an example, contractors and subcontractors from Sacramento (where work is not so buoyant) are turning up on the lists of bidders for Bay Area projects.

When contractors do decide to increase their staff, sometimes it is not that easy, because people have left the industry and found jobs elsewhere. For instance, experienced site superintendents have become difficult to find in the Bay Area.

The Architectural Billings Index had been up for the first two months of the year, but dropped below its break-even point of 50, to finish in negative territory for March, at 48.2. That confirmed the belief that things were not completely back on track yet, although weather conditions may have had some part in the drop. Nevertheless, the idea of 'making do with less' has not only been affecting contractors, but has influenced commerce generally.

The recent improvements in the unemployment situation gives hope that things might be changing for the better, but economic growth projections for this year are still on the low side. In fact, the OECD recently reduced its projection for growth globally. The OECD's latest predictions reduced anticipated growth in the US and China, while increasing expectations for Europe. The prediction for European growth now stands at 1.2% vs. 2.6% for the U.S. But growth of any size is good, and revenue growth for contractors and design professions has been moving up for a number of years now.

Slow growth may indeed have some advantages. For one thing, it does give contractors and manufacturers opportunities to increase staff and ramp up production. That, in turn, should help to prevent dramatic increases in material costs and bid prices. Don't get too comfortable, however, because history shows that markets seldom move smoothly for long. Rather they are known for dramatic swings up and down. How else can the markets make our lives interesting?

The public-sector was a major source of work during the recession, but has paid the price recently. Happily, the private sector has compensated nicely, and growth in employment and property valuations all add up to increased tax revenue that is helping the public-sector start to grow again. Funding for projects has been another sticking point, but even that situation is improving.

So we might still not be there yet, but we're getting closer.

Geoff Canham, Editor

California Tightens Energy Controls

California's Title 24 Energy Efficiency Standards were updated effective from January 1, 2014, and continue the push for energy reductions and reduction of the reliance on oil, which will hopefully improve the situation in regard to global warming.

The biggest changes relate to electrical work in commercial buildings, and trying to ensure that energy is not being used unnecessarily. Motion sensors and dimming controls are now required to dim fixtures in corridors and stairwells when no motion is detected. They are also required in aisles and open spaces of warehouses, reducing lighting levels by at least 50% when unoccupied. Egress lighting must be shut off outside of normal occupied times, although offices are allowed to have lighting on designated paths of egress, but at reduced levels. Full range dimming and associated controls are required for most fluorescent and LED fixtures, and the central lighting control system is to have demand response control (load shedding) ability. Daylight harvesting controls are required for all interior spaces where over 120W of load is within the daylit zone, providing 'adaptive lighting' that automatically dims or shuts off when not required.

Outside of the buildings, motion sensors are required on site lighting pole fixtures mounted under 25' above finished grade. Motion sensors and daylight harvesting controls are now required in parking structures to dim fixtures when daylight is adequate or no motion detected. Residential buildings are required to have high-efficacy sources, vacancy sensors and controls in bathrooms. Retrofit projects must meet new-construction lighting standards for lighting power density (LPD) and dimming requirements if 10% or more of the lighting is being changed or 40 or more ballasts are being replaced.

Demand response (DR) is now required in all commercial buildings with floor areas of 10,000 SF or more (previously it was only required for retail spaces with sales floors over 50,000 SF). These systems automatically reduce light energy use to at least 15% below the building's maximum lighting power in response to a DR signal from the utility company.

On commercial buildings, the lighting and lighting controls requirements can add around 20% to the lighting package, or about 7% to the overall electrical section. Changes to metering and receptacle load controls, such as demand response control and plug load control (automatic shut-off control for task lighting, etc., in office areas) adds around 10% to electrical distribution costs, or 1.5% to 2% to the overall electrical section.

Title 24 changes also affect the mechanical sections, and those changes include new requirements for fan control and integrated economizer (packaged units 6 tons and up must be VAV), and for fan control for fractional motors. There are also increased minimum equipment efficiencies required on chillers and cooling towers, and increased acceptance testing requirements for HVAC sensors and controls, along with automatic demand shed control requirements. These changes can add around 5% to mechanical costs.

Other changes include increased fenestration and air barrier requirements (to reduce solar gains, increase visual light transmittance, and to limit air leakage rates except in mild climates), and minimum wall and roof insulation requirements, along with increased low-slope cool roof requirements (to give increased reflectance). There are also increased mandatory requirements for computer rooms and data centers, refrigeration systems in supermarkets and warehouses, and laboratory exhaust VAV and heat recovery systems. Commercial buildings are required to be solar ready, third party design review is required during design, and there are additional commissioning requirements.

Assuming that the electrical systems account for about 12.5% of the construction cost, and mechanical account for about 17.5%, the overall effect of these Title 24 changes result in additional construction costs of around 2%.

Newsletter designed by Katie Levine of Vallance, Inc.